



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
**NATIONAL MARINE FISHERIES SERVICE**  
Alaska Fisheries Science Center  
Resource Assessment and Conservation Engineering Division  
7600 Sand Point Way Northeast  
BIN C15700, Building 4  
Seattle, Washington 98115-0070

May 18, 2000 F/AKC2:Sd

**Preliminary Cruise Results**  
**NOAA SHIP *Miller Freeman***  
**Cruise No. 2000-03**  
**Acoustic-Trawl Survey of Walleye Pollock in the Southeast**  
**Bering Sea Shelf and Aleutian Basin near Bogoslof Island**

Midwater Assessment and Conservation Engineering  
Alaska Fisheries Science Center  
Seattle, WA 98115

Scientists from the Alaska Fisheries Science Center (AFSC) conducted an echo integration-trawl (EIT) survey of walleye pollock (*Theragra chalcogramma*) on the southeast Bering Sea shelf and in the Aleutian Basin near Bogoslof Island from February 27 to March 13, 2000 (16 sea days). This research cruise was part of a long-term, ongoing effort to monitor walleye pollock abundance and distribution in the Bering Sea. The Bering Sea shelf survey was the sixth such winter survey conducted since 1989. Surveys of the Bogoslof Island area have been conducted annually (except 1990) since 1988. The survey in 1999 was conducted by the Japan Fisheries Agency. Data collected during the Bering Sea shelf survey will be used to estimate the abundance and distribution of walleye pollock inhabiting the eastern portion of an area designated as the Steller sea lion Conservation Area (SCA). The Bogoslof Island area survey was designed to assess the abundance of walleye pollock spawning over deep water in the southeastern Aleutian Basin.

The vessel's itinerary was as follows:

Feb 25	Embark scientists in Dutch Harbor, AK.
Feb 27	Standard sphere calibration in Captains Bay, AK.
Feb 28-Mar 2	Acoustic-trawl survey of the southeast Bering Sea shelf; touch and go (Mar 2) in Dutch Harbor to disembark scientists.



Mar 2-12	Acoustic-trawl survey of the Bogoslof Island region; touch and go (Mar 8) in Dutch Harbor to disembark crew member.
Mar 12	Conduct trawls targeting Atka mackerel.
Mar 13	Standard sphere calibration in Captains Bay, Dutch Harbor, AK; end of cruise.

The primary cruise objective was to collect echo integration data and midwater and demersal trawl data essential to determine the distribution, biomass, and biological composition of walleye pollock in the southeast Bering Sea shelf and southeastern Aleutian Basin. Secondary objectives involved a number of separate projects and investigators from the AFSC and the Alaska Department of Fish and Game (ADF&G).

## METHODS

### Sampling Equipment

Acoustic data were collected with a Simrad EK500<sup>1</sup> quantitative echo-sounding system on board the NOAA ship *Miller Freeman*, a 66-m (216-ft) stern trawler equipped for fisheries and oceanographic research. The Simrad 38-kHz and 120-kHz split-beam transducers were mounted on the bottom of the vessel's centerboard. With the centerboard fully extended, the transducers were 9 m below the water surface. System electronics were housed inside the vessel in a permanent laboratory space dedicated to acoustics. Data from the Simrad EK500 echo sounder/receiver were processed using Simrad BI500 echo integration and target strength data analysis software on a SUN workstation. Results presented in this document are based on the 38-kHz data.

An Aleutian Wing 30/26 trawl (AWT) was used for sampling midwater echo sign. The AWT was a full-mesh wing trawl constructed of nylon except for polyethylene towards the aft section of the body and the codend. Headrope and footrope lengths each measured 81.7 m (268 ft) and mesh sizes tapered from 325.1 cm (128 in) in the forward section of the net to 8.9 cm (3.5 in) in the codend. The net was fitted with a 3.2-cm (1.25-in) codend liner. It was fished with 82.4 m (270 ft) of 1.9-cm (0.75-in) diameter 8x19 non-rotating dandylines, 227.3-kg (500-lb) or 340.9-kg (750-lb)

---

<sup>1</sup> Reference to trade names or commercial firms does not constitute U.S. Government endorsement.

tom weights on each side, and 5-m<sup>2</sup> "Fishbuster" doors [1,250 kg (2,750 lb) each]. Vertical and horizontal net opening and depth were monitored with a WesMar third wire netsounder system attached to the headrope of the trawl.

Fish on and near bottom were sampled with a polyethylene Nor'eastern (PNE) high-opening bottom trawl equipped with roller gear. (The PNE was also used on three occasions to sample midwater fish sign.) The PNE was constructed with stretch mesh sizes that ranged from 13 cm (5 in) in the forward portion of the net to 89 mm (3.5 in) in the codend. It was fitted with a nylon codend liner with a mesh size of 32 mm (1.25 in). The 27.2-m (89.1-ft) headrope held 21 floats [30 cm (12 in) diameter]. A 24.7-m (81-ft) chain fishing line was attached to the 24.9-m (81.6-ft) footrope which was constructed of 1-cm (0.4-in) 6 x 19 wire rope wrapped with polypropylene rope. The 24.2-m (79.5-ft) roller gear was constructed with 36-cm (14-in) rubber bobbins spaced 1.5-2.1 m (5-7 ft) apart. A solid string of 10-cm (4-in) rubber disks separated some of the bobbins in the center section of the roller gear. Two 5.9-m (19.5-ft) wire rope extensions with 10-cm (4-in) and 20-cm (8-in) rubber disks were used to span the two lower flying wing sections and were attached to the roller gear. The roller gear was attached to the fishing line using chain toggles [2.9 kg (6.5 lb.) each] which were comprised of five links and one ring. The trawl was rigged with triple 54.9-m (180-ft) galvanized wire rope dandyline. The net was fished with the "Fishbuster" doors.

Temperature/depth profile data were collected with a micro bathythermograph (MBT) attached to the headrope during each trawl. Conductivity-temperature-depth (CTD) data were collected with a Seabird CTD system at calibration sites and other selected locations. Sea surface temperature and salinity, environmental data, and data for the Marine Operations Abstract (MOA) were collected using the *Miller Freeman's* Scientific Collection System (SCS). Ocean current profile data were obtained using the vessel's centerboard-mounted acoustic Doppler current profiler system operating continuously in water-profiling mode.

### Survey Methods

The southeast Bering Sea shelf was surveyed with 8 east-west parallel transects totaling about 400 nautical miles (nmi) (Fig. 1). Transects and western transect endpoints were chosen to ensure that this portion of the survey remained within the boundaries of the Steller sea lion Conservation Area; eastern transect endpoints were at bottom depths of approximately 100 m or were limited by Unimak Island, but at times they were extended

farther east until fish sign disappeared. Transect spacing was 12.5 nmi. The Bogoslof Island portion of the survey totaled about 1225 nmi of transects. The trackline consisted of 33 north-south parallel transects beginning at about 166°W and ending near 170°15'W. Transect spacing at the eastern end and offshore in deeper basin waters was 10 nmi. Spacing nearshore west of 167°W was 5 nmi, decreasing to 2.5 nmi NE of Umnak Island and between Umnak Island and the Islands of Four Mountains. Southern transect endpoints were at bottom depths of approximately 100 m on the Aleutian shelf but varied depending on bottom depth and fish echo sign. The northern extent of the survey area along transects 10.5-16 was between roughly 53°45'N and 54°6'N, and between roughly 54°30'N and 54°40'N for transects 1-10.

Echo integration and trawl data were collected 24 hours per day. Vessel speeds averaged 11.1 kts on the shelf and 11.6 kts on the basin during acoustic data collection. Echo integration data were collected from 14 m below the surface to either within 0.5 m of the bottom or to 1000 m, depending on bottom depth. These data were thoroughly scrutinized by one or more scientists and stored in an INGRES database. When properly scaled, they are used to provide estimates of walleye pollock density.

Midwater and bottom trawl hauls were made at selected locations to identify echo sign and provide biological data and pollock samples. Haul duration was kept to the minimum necessary to ensure an adequate sample. Average trawling speed was about 3 kts. The AWT's vertical opening averaged about 28 m; the net opening of the PNE averaged about 6 m when fished on bottom and about 11 m when fished off bottom. Each trawl catch was completely sorted unless it exceeded about 1000 kg, at which point splits of the catch were sorted instead. Total weights and numbers of individuals, by species, were determined for each catch. Individual pollock were further sampled to determine sex, fork length, body weight, age, maturity, and ovary weight. Both otoliths were removed and stored in a solution of 50% ethanol for subsequent age determination. An electronic scale was used to determine all weights taken from individual pollock specimens. Fish lengths were determined to the nearest cm with a Polycorder measuring device (a combination of a bar code reader and a hand-held computer). Pollock maturities were determined by visual inspection of gonads based on an internationally accepted 8-stage scale.

Several special projects were completed in addition to species collections associated with the estimation of pollock biomass. Pollock ovaries were collected from pre-spawning females for a

study of interannual variation in fecundity. Fin, muscle, heart, and liver samples were taken from walleye pollock for genetics research by the AFSC's Fisheries-Oceanography Coordinated Investigations (FOCI) program and the ADF&G. Pollock stomachs were collected for the Food Habits Laboratory, AFSC to examine prey items. Whole pollock were collected and frozen for a stable-isotope study at the National Marine Mammal Laboratory, AFSC. Five trawls were conducted to capture live Atka mackerel for an AFSC test of data-storage tags.

### **PRELIMINARY RESULTS**

Four standard sphere calibrations of the 38-kHz and 120-kHz scientific acoustic systems were made in conjunction with the survey (Table 1). No significant differences were observed in the 38-kHz system parameters among the four calibrations. Results from calibrating the 120-kHz system are not presented here as that system was not used in the acoustic data analysis.

Biological data were collected and samples preserved from 4 midwater trawls and 5 bottom trawls on the shelf, 11 midwater trawls in the Aleutian Basin, and 5 bottom trawls targeting Atka mackerel (Fig. 1, Tables 2-7). Pollock was the predominant species caught, especially in Aleutian Basin trawls and shelf bottom trawls. Pollock would also have been more predominant in shelf midwater trawls had it not been that haul 1 caught over 2,500 kg of jellyfish. Fairly large numbers of rock sole were caught on the shelf; likewise, fairly large numbers of lanternfish and redstripe and northern rockfish were caught in the basin and in the "Atka mackerel" tows, respectively.

On the southeastern Bering Sea shelf, pollock were observed from near the start of transect 101 to near the end of transect 108 (Fig. 2). On the first several transects, they formed dense, near-bottom aggregations at depths between 95-100 m. These aggregations often extended for several miles. Dense pollock schools were found adjacent to Unimak Island beginning at a depth of about 50 m; some continued westward to bottom depths >150 m. Highest densities were observed on transects 103, 104, and 106. In the Bogoslof area, pollock distribution was similar to that in 1998. Along transects 1-6, pollock aggregations were sparse. On the south end of transect 7, a large pollock school was encountered in nearly the same location northeast of Umnak Is. as in previous years. Farther west, very few pollock were observed until transect 11.5 (about 169°W). As in previous Bogoslof area surveys, most pollock were concentrated in Samalga Pass between Umnak Island and the Islands of Four Mountains (169°-170°W).

They were distributed in spawning aggregations 3-14 nmi in horizontal extent and 150-300 m in vertical extent between 300-700 m in the water column.

The average fork length of pollock on the shelf was 44 cm and 43 cm for females and males, respectively (Fig. 3a). Most pollock were between 41-47 cm. In Bogoslof, average fork lengths of pollock increased from east to west. The easternmost hauls (hauls 10-12 and 24) caught pollock with fork lengths averaging 50 cm and 47 cm for females and males (Fig. 3b). Between 167.5°-168°W, fork lengths averaged 56 cm and 53 cm for females and males (Fig. 3c). Fork lengths of pollock encountered west of 168°W averaged 58 cm and 55 cm for females and males (Fig. 3d). The length range of pollock sampled was 30-73 cm for sexes combined. Pollock maturities observed on the shelf showed roughly equal proportions of developing and pre-spawning females (43% vs. 48%), but a much higher proportion of prespawning males (19% vs. 74%) (Fig. 4). No spawning fish were observed. In Bogoslof, 95% of males and 94% of females were pre-spawning. Only 4% of males and 1% of females were actively spawning. The mean gonadosomatic index (GSI) for prespawning females on the shelf was 0.08, less than half that observed in Bogoslof (0.17) (Fig. 5).

Oceanographic data were collected from 22 successful MBT casts (Table 2) and 3 CTD casts. Temperature profiles showed a well-mixed water column. Average temperature by 50-m depth bins ranged from 3.0-3.7° C between the surface and 550 m (Fig. 7). Surface temperatures (Fig. 8) ranged from about 1.5 to 3.8° C. Near-shore areas west of 167°30'W (where most of the Bogoslof pollock echo sign was detected) had warmer surface temperatures than regions farther offshore or east of 167°30'W. Coldest surface temperatures encountered during the survey were north of Unimak Island.

#### SCIENTIFIC PERSONNEL

<u>Name</u>	<u>Sex/ Nationality</u>	<u>Position</u>	<u>Organization</u>	<u>Dates Aboard</u>
Taina Honkalehto	F/USA	Chief Scientist	AFSC	2/25-3/13
Steve de Blois	M/USA	Fish. Biologist	AFSC	2/25-3/13
Mike Guttormsen	M/USA	Fish. Biologist	AFSC	2/25-3/13
Bill Karp	M/USA	Fish. Biologist	AFSC	2/25-3/2
Kevin Landgraf	M/USA	Fish. Biologist	AFSC	2/25-3/13
Denise McKelvey	F/USA	Fish. Biologist	AFSC	2/25-3/13
Bill Patton	M/USA	Fish. Biologist	AFSC	2/25-3/13
Phil Porter	M/USA	Computer Spec.	AFSC	2/24-3/13
Daniel Twohig	M/USA	Electronics Tech.	AFSC	2/24-3/2

AFSC - Alaska Fisheries Science Center, Seattle, WA

Table 1. Summary of sphere calibrations conducted before, during, and after the winter 2000 pollock acoustic-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas, MF2000-03.

Date (2000)	Location	Freq (kHz)	Water Temp (deg. C)		Sphere Range from Transducer (m)	TS Gain (dB)	SV Gain (dB)	Along 3 dB Beam Width (deg.)	Angle Offset	
			at Transducer*	at Sphere					Along	Athwart
27 Jan	Port Susan, WA	38	9.4	9.8	31.3	25.8	25.5	6.91	-0.09	0.03
		120	9.4	9.9	25.9	26.0	26.1	--	--	--
27 Feb	Captains Bay, AK	38	2.8	3.0	29.1	25.8	25.6	6.92	-0.08	0.03
		120	2.8	3.0	23.5	25.3	25.4	7.11	-0.12	-0.21
13 Mar	Captains Bay, AK	38	2.9	3.1	30.3	25.9	25.5	--	--	--
		120	2.9	3.1	28.7	25.0	25.3	--	--	--
27 Mar	Uyak Bay, AK	38	4.0	4.0	29.4	25.8	25.5	6.92	-0.08	-0.01
		120	4.0	4.0	23.9	24.9	24.9	7.32	0.04	0.47
Feb-Mar	System settings during surveys	38	--	--	--	25.7	25.5	6.9	-0.08	-0.01*
		120	--	--	--	25.3	25.4	7.1	-0.12	-0.21

\* The transducer was located approximately 9 m below the water surface.

\* Angle offset athwart was 0.03 during MF2000-04 (Mar 15-28).

Note: Gain and beam pattern terms are defined in the "Operator Manual for Simrad EK500 Scientific Echo Sounder (1993)" available from Simrad Subsea A/S, Standpromenaden 50, P.O. Box 111 N-3191 Horten, Norway.

Table 2. Summary of trawl stations and catch data from the winter 2000 pollock acoustic-trawl survey of the southeast Bering Sea shelf (hauls 1-9) and Bogoslof Island areas, MF2000-03.

Haul No.	Gear Type	Date (GMT)	Time (GMT)	Duration (minutes)	<u>Start Position</u>				<u>Depth (m)</u>		<u>Temp. (deg. C)</u>		MBT No.	<u>Pollock Catch</u>		<u>Other Catch</u>
					Latitude (N)		Longitude (W)		Gear	Bottom	Gear	Surface		(kg)	number	(kg)
1	317	29 Feb	0:03	55	55	54.39	165	4.82	86	100	--	2	--	2.5	4	2,667.7
2	172	29 Feb	3:29	15	55	53.97	165	7.55	98	98	2	1.5	2	1,440.2	2,481	627.2
3	317	29 Feb	7:19	15	55	53.55	164	40.32	88	96	1.7	1.7	3	745.1	1,030	248.8
4	317	29 Feb	16:52	11	55	41.13	165	11.33	103	110	2.8	2.1	4	2,787.2	4,694	2.8
5	172	1 Mar	0:27	4	55	28.91	165	6.25	109	109	3	2.1	5	6,717.3	10,827	100.7
6	172	1 Mar	1:53	2	55	28.87	165	11.21	113	113	2.9	2.2	6	968.5	1,775	26.5
7	172	1 Mar	21:03	2	54	52.33	164	43.87	67	67	1.9	1.8	7	3,307.7	4,557	2.3
8	172	2 Mar	0:27	2	54	51.50	165	24.10	131	131	3.4	2.5	8	1,605.0	2,792	0.0
9	317	2 Mar	3:29	13	54	51.58	165	54.04	127	148	3.2	2.6	9	2,248.0	4,418	0.0
10	317	3 Mar	12:40	20	54	24.96	166	35.20	483	574	3.7	3.3	10	46.7	43	3.7
11	317	4 Mar	1:31	17	54	26.59	167	11.11	517	568	3.6	3.1	11	34.1	34	5.2
12	317	4 Mar	4:06	37	54	27.37	167	8.20	485	542	3.7	3.2	12	142.7	157	9.9
13	317	5 Mar	0:38	10	53	35.27	167	40.64	486	864	3.6	3.3	13	8,918.7	7,387	1.3
14	317	7 Mar	10:17	10	53	11.17	168	59.84	498	690	3.6	3.6	15	651.8	411	4.5
15	317	9 Mar	22:52	4	53	5.33	169	28.55	453	548	3.6	3.5	16	730.3	486	1.4
16	317	10 Mar	3:29	12	53	1.31	169	19.89	485	820	3.5	3.6	17	2,243.5	1,504	6.5
17	317	10 Mar	11:14	7	53	2.59	169	11.93	385	853	4.1	3.6	--	1,050.9	686	0.7
18	172	10 Mar	21:58	35	53	10.13	169	29.78	515	1039	3.6	3.6	19	221.5	150	5.3
19	172	11 Mar	1:12	81	53	10.26	169	29.74	499	917	3.6	3.6	20	378.9	252	4.3

∞



Haul No.	Gear <sup>1</sup> Type	Date (GMT)	Time (GMT)	Duration (minutes)	<u>Start Position</u>			<u>Depth (m)</u>		<u>Temp. (deg. C)</u>		MBT No.	<u>Pollock Catch</u>		<u>Other Catch</u>
					Latitude (N)	Longitude (W)		Gear	Bottom	Gear	Surface		(kg)	number	(kg)
20	172	12 Mar	10:10	17	53 35.39	167 43.13		475	818	3.7	3.4	21	514.2	358	1.0
21	172	12 Mar	19:10	16	54 26.17	165 33.20		96	96	3	3	22	1.2	1	276.0
22	172	12 Mar	21:24	15	54 22.71	165 36.64		86	86	3.5	3.2	--	0.5	1	1,239.5
23	172	13 Mar	2:32	15	54 13.00	166 2.19		57	57	3.3	3.2	23	0.0	0	30.8
24	172	13 Mar	4:26	10	54 13.93	166 2.58		103	103	3.4	3.3	24	5,900.1	7,715	99.9
25	172	13 Mar	7:31	15	54 6.35	166 21.48		97	97	3.4	3.3	25	0.0	0	162.3

<sup>1</sup> gear type 317 = Aleutian wing trawl and 172 = poly Nor'eastern bottom trawl

Table 3. Summary of pollock biological samples and measurements collected during the winter 2000 acoustic-trawl survey of the southeast Bering Sea shelf (hauls 1-9) and Bogoslof Island areas, MF2000-03.

Haul	Length	Maturity	Otoliths	Fish Weight	Ovary Weight
1	4	0	0	0	0
2	364	70	70	70	13
3	277	44	44	44	5
4	360	62	62	62	18
5	341	26	26	26	12
6	397	39	39	39	11
7	331	59	59	59	20
8	378	62	62	62	12
9	412	53	53	53	17
10	43	43	43	43	19
11	34	10	10	10	0
12	157	43	43	43	17
13	288	85	85	85	39
14	330	88	88	88	35
15	327	74	74	74	37
16	313	70	70	70	24
17	305	81	81	81	41
18	150	39	39	39	19
19	252	42	42	42	21
20	302	55	55	55	45
21	1	0	0	0	0
22	1	0	0	0	0
24	281	0	0	0	0
Totals	5,648	1,045	1,045	1,045	405

Table 4. Summary of biological samples collected for special projects during the winter 2000 pollock acoustic-trawl survey of the southeast Bering Sea shelf (hauls 1-9) and Bogoslof Island areas, MF2000-03.

Haul	Stomach Collection	Ovary Collection	Genetics		Stable Isotope Fish Collection	Live Atka Mackerel Collection
			#1 <sup>1</sup>	#2 <sup>2</sup>		
1	-	-	-	-	-	-
2	-	13	-	-	x	-
3	-	5	-	-	-	-
4	-	-	-	-	-	-
5	-	-	-	-	x	-
6	-	-	-	-	x	-
7	20	-	-	-	x	-
8	10	-	-	-	-	-
9	20	-	-	-	-	-
10	-	10	-	10	-	-
11	-	-	-	10	x	-
12	-	13	-	10	x	-
13	-	14	-	10	x	-
14	-	4	-	20	-	-
15	-	1	-	20	-	-
16	-	3	100	20	-	-
17	-	-	-	-	-	-
18	-	1	-	-	x	-
19	-	-	-	-	-	-
20	-	-	-	-	x	-
21	-	-	-	-	x	2
22	-	-	-	-	x	2
23	-	-	-	-	-	-
24	-	-	-	-	x	-
25	-	-	-	-	-	-
Total	50	64	100	100	12 sites	4

<sup>1</sup> #1-Fin clips only

<sup>2</sup> #2-Tissue samples, otoliths taken

Table 5. Summary of catch by species in 4 midwater tows on the shelf during the winter 2000 acoustic-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas, MF2000-03.

Common Name	Scientific Name	Weight (kg)	Weight (%)	Numbers
walleye pollock	<i>Theragra chalcogramma</i>	5,782.8	66.5	10,146
jellyfish unidentified	Scyphozoa	2,661.0	30.6	--*
<i>Chrysaora</i> jellyfish	<i>Chrysaora</i> sp.	155.9	1.8	--*
rock sole unidentified	<i>Lepidopsetta</i> sp.	73.3	0.8	296
Pacific cod	<i>Gadus macrocephalus</i>	14.7	0.2	2
flathead sole	<i>Hippoglossoides elassodon</i>	10.5	0.1	22
smooth lumpsucker	<i>Aptocyclus ventricosus</i>	2.7	<0.1	1
Alaska skate	<i>Bathyraja parmifera</i>	1.0	<0.1	1
prowfish	<i>Zaprora silenus</i>	0.1	<0.1	1
Totals		8,702.1		10,469

\* No counts taken

Table 6. Summary of catch by species in 5 bottom tows on the shelf during the winter 2000 acoustic-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas, MF2000-03.

Common Name	Scientific Name	Weight (kg)	Weight (%)	Numbers
walleye pollock	<i>Theragra chalcogramma</i>	14,038.7	94.9	22,432
jellyfish unidentified	Scyphozoa	505.4	3.4	--*
rock sole unidentified	<i>Lepidopsetta</i> sp.	103.8	0.7	344
<i>Chrysaora</i> jellyfish	<i>Chrysaora</i> sp.	78.4	0.5	--*
flathead sole	<i>Hippoglossoides elassodon</i>	35.9	0.2	78
Pacific cod	<i>Gadus macrocephalus</i>	27.6	0.2	16
Pacific halibut	<i>Hippoglossus stenolepis</i>	3.6	<0.1	4
arrowtooth flounder	<i>Atheresthes stomias</i>	1.2	<0.1	3
sea urchin unidentified	Echinoidea	0.6	<0.1	3
starfish unidentified	Asteroidea	0.1	<0.1	1
hermit crab unidentified	Paguridae	0.1	<0.1	1
Bairdi tanner crab	<i>Chionoecetes bairdi</i>	<0.1	<0.1	1
Totals		14,795.4		22,883

\* No counts taken

Table 7. Summary of catch by species in 11 midwater tows in the Aleutian Basin during the winter 2000 acoustic-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas, MF2000-03.

Common Name	Scientific Name	Weight (kg)	Weight (%)	Numbers
walleye pollock	<i>Theragra chalcogramma</i>	14,933.3	99.7	11,468
squid unidentified	Teuthoidea	8.9	0.1	74
lanternfish unidentified	Myctophidae	8.2	0.1	787
smooth lumpsucker	<i>Aptocyclus ventricosus</i>	8.0	0.1	4
jellyfish unidentified	Scyphozoa	6.3	<0.1	--*
Pacific lamprey	<i>Lampetra tridentata</i>	4.2	<0.1	7
Greenland turbot	<i>Reinhardtius hippoglossoides</i>	2.7	<0.1	1
chinook salmon	<i>Oncorhynchus tshawytscha</i>	2.5	<0.1	1
arrowtooth flounder	<i>Atheresthes stomias</i>	1.6	<0.1	1
magistrate armhook squid	<i>Berryteuthis magister</i>	0.4	<0.1	1
northern smoothtongue	<i>Leuroglossus schmidtii</i>	0.4	<0.1	60
grenadier unidentified	Macrouridae	0.3	<0.1	1
slender barracudina	<i>Lestidiops ringens</i>	0.2	<0.1	1
Pacific viperfish	<i>Chauliodus macouni</i>	0.1	<0.1	3
bluethroat argentine	<i>Nansenia candida</i>	0.1	<0.1	1
blacksmelt unidentified	<i>Bathylagus sp.</i>	<0.1	<0.1	2
shrimp unidentified	Decapoda	<0.1	<0.1	7
Totals		14,977.1		12,419

\* No counts taken

Table 8. Summary of catch by species in 5 bottom tows targeting Atka mackerel during the winter 2000 acoustic-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas, MF2000-03.

Common Name	Scientific Name	Weight (kg)	Weight (%)	Numbers
walleye pollock	<i>Theragra chalcogramma</i>	5,901.8	76.5	7,717
Pacific cod	<i>Gadus macrocephalus</i>	544.2	7.1	543
redstripe rockfish	<i>Sebastes proriger</i>	407.4	5.3	2,730
sponge unidentified	Porifera	312.5	4.1	--*
northern rockfish	<i>Sebastes polyspinis</i>	287.7	3.7	581
yellow Irish lord	<i>Hemilepidotus jordani</i>	70.0	0.9	77
rock sole unidentified	<i>Lepidopsetta sp.</i>	51.3	0.7	100
dusky rockfish	<i>Sebastes ciliatus</i>	46.0	0.6	83
Pacific halibut	<i>Hippoglossus stenolepis</i>	26.7	0.3	30
sea urchin unidentified	Echinoidea	16.5	0.2	190
Pacific ocean perch	<i>Sebastes alutus</i>	9.6	0.1	15
kelp greenling	<i>Hexagrammos decagrammus</i>	6.9	0.1	10
Oregon triton	<i>Fusitriton oregonensis</i>	5.4	0.1	133
chinook salmon	<i>Oncorhynchus tshawytscha</i>	3.8	<0.1	1
Atka mackerel	<i>Pleurogrammus monopterygius</i>	3.3	<0.1	5
prowfish	<i>Zaprora silenus</i>	3.2	<0.1	1
silvergray rockfish	<i>Sebastes brevispinis</i>	2.2	<0.1	2
starfish unidentified	Asteroidea	2.1	<0.1	8
hermit crab unidentified	Paguridae	1.6	<0.1	38
cushion starfish	<i>Pteraster tessellatus</i>	1.6	<0.1	6
unsorted invertebrates	--	1.3	<0.1	--*
empty bivalve shells	--	0.9	<0.1	--*
searcher	<i>Bathymaster signatus</i>	0.9	<0.1	2
scaled crab	<i>Placetron wosnessenskii</i>	0.9	<0.1	4
sea cucumber unidentified	Holothuroidea	0.8	<0.1	4
sea anemone unidentified	Actiniaria	0.5	<0.1	6
snailfish unidentified	Cyclopteridae	0.5	<0.1	1
tunicate unidentified	Ascidacea	0.3	<0.1	1
empty snail shells	--	0.3	<0.1	15
jellyfish unidentified	Scyphozoa	0.2	<0.1	--*
Alaska falsejingle	<i>Pododesmus macroschisma</i>	0.1	<0.1	2
mussel unidentified	Mytilidae	<0.1	<0.1	4
scallop unidentified	Pectinidae	<0.1	<0.1	6
brittlestarfish unidentified	Ophiuroidea	<0.1	<0.1	--*
Totals		7,710.2		12,315

\* No counts taken

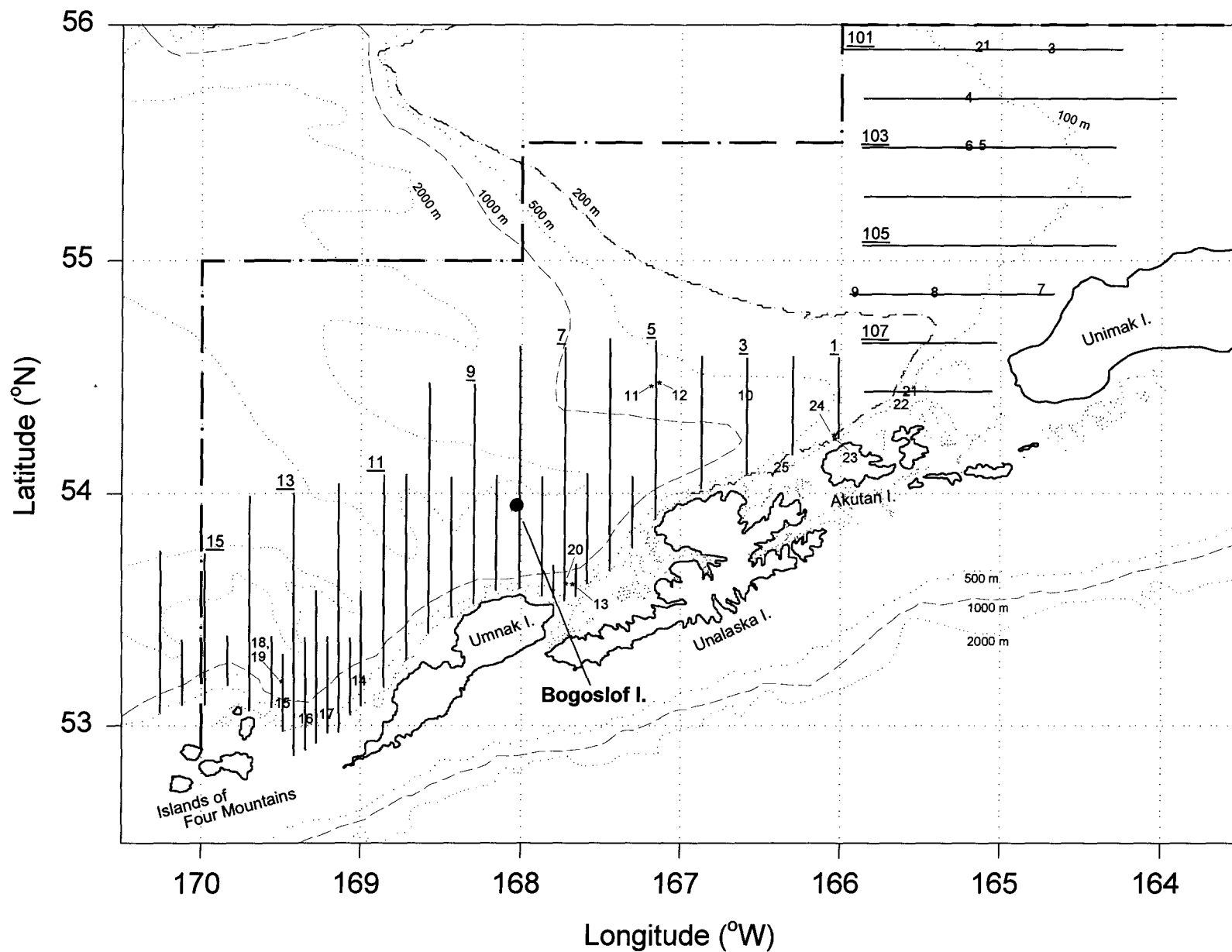


Figure 1. Trackline and haul locations from the winter 2000 acoustic-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas, MF2000-03. Transect numbers are underlined. Dashed line indicates boundary of Steller sea lion Conservation Area.

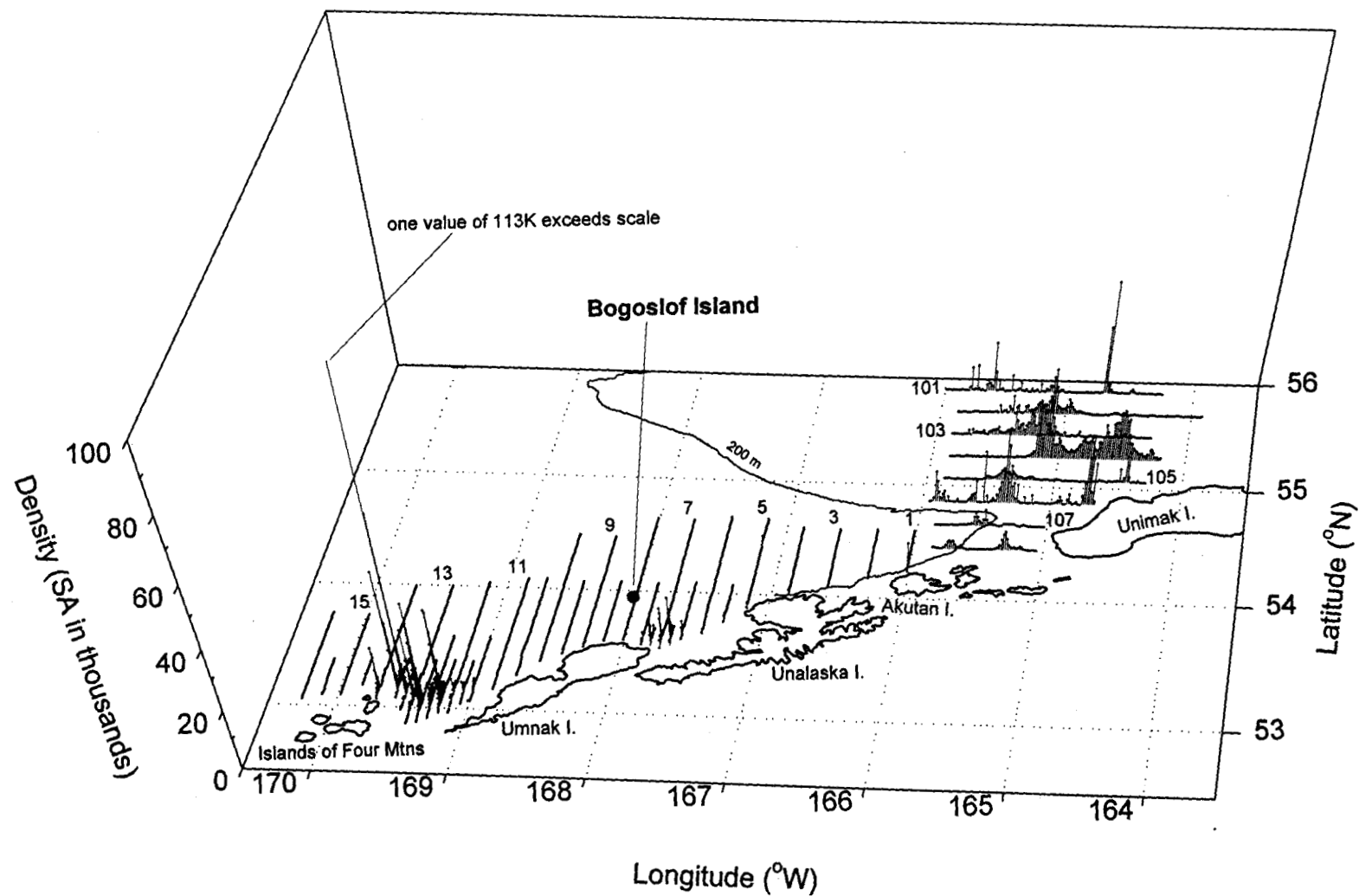


Figure 2. Relative pollock density along trackline from the winter 2000 acoustic-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas, MF2000-03. Transect numbers are indicated.



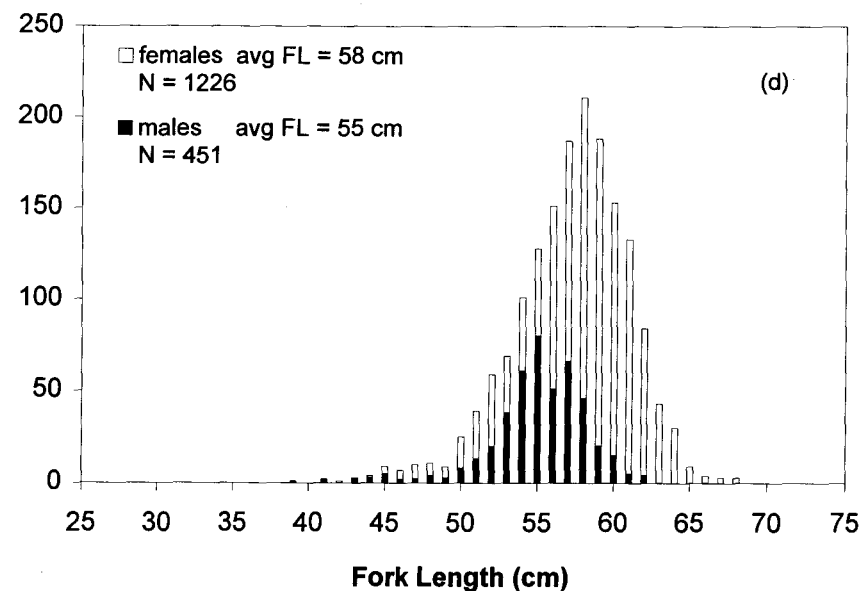
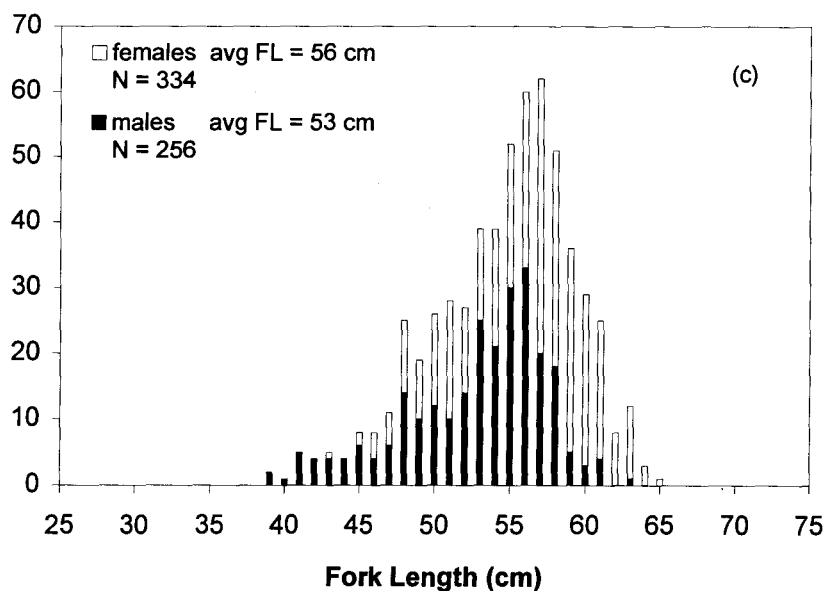
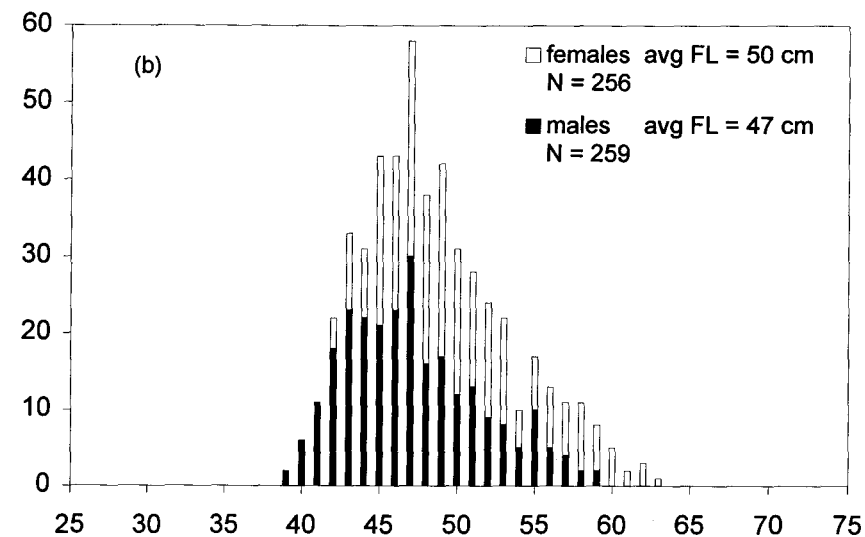
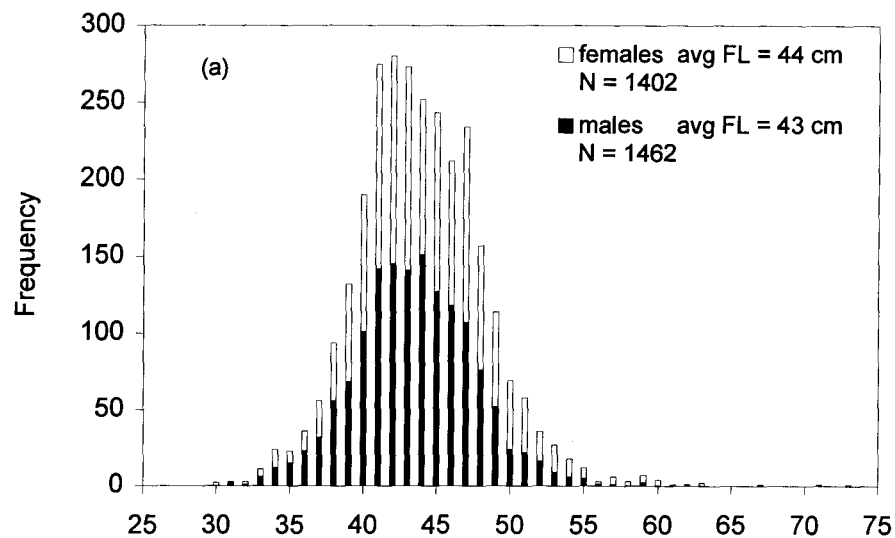


Figure 3. Pooled raw length frequencies from trawls (a) on the southeast Bering Sea shelf, (b) between 166 and 167.5 deg. W, (c) between 167.5 and 168 deg. W, and (d) west of 168 deg. W from the winter 2000 acoustic-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas, MF2000-03.

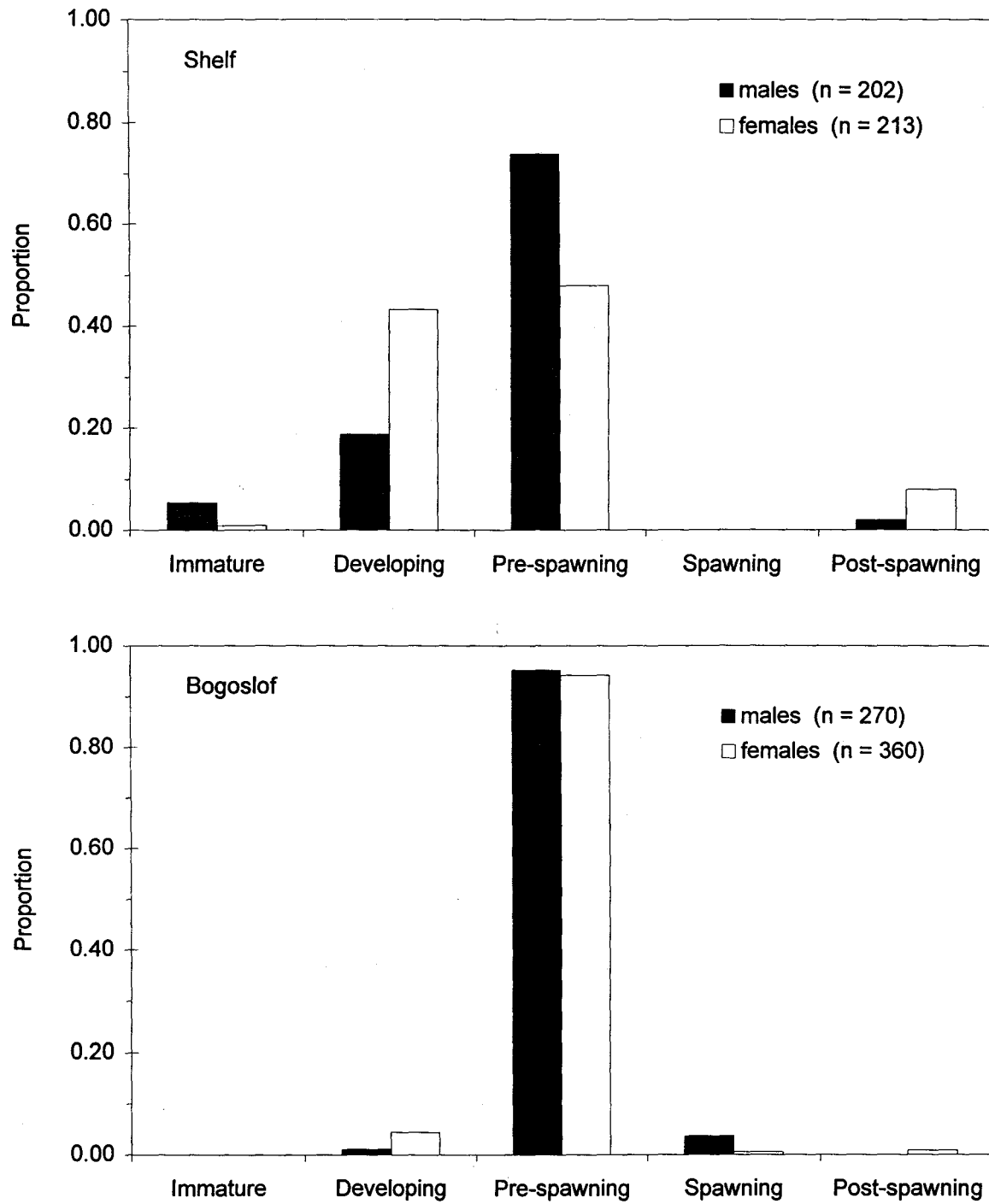


Figure 4. Maturity stages of pollock observed during the winter 2000 acoustic-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas, MF2000-03

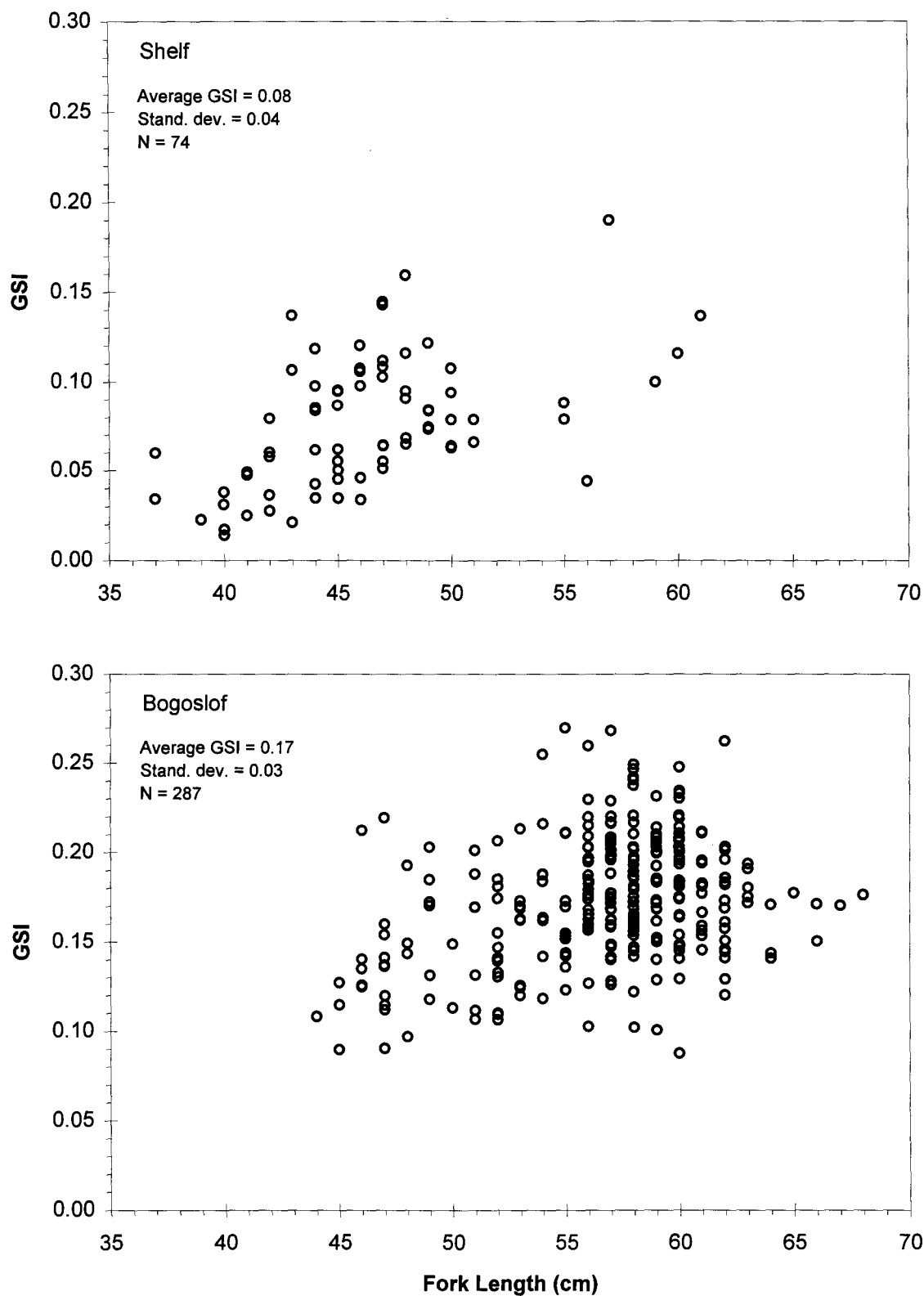


Figure 5. Pollock gonadosomatic indices for mature females as a function of length from the winter 2000 acoustic-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas, MF2000-03.

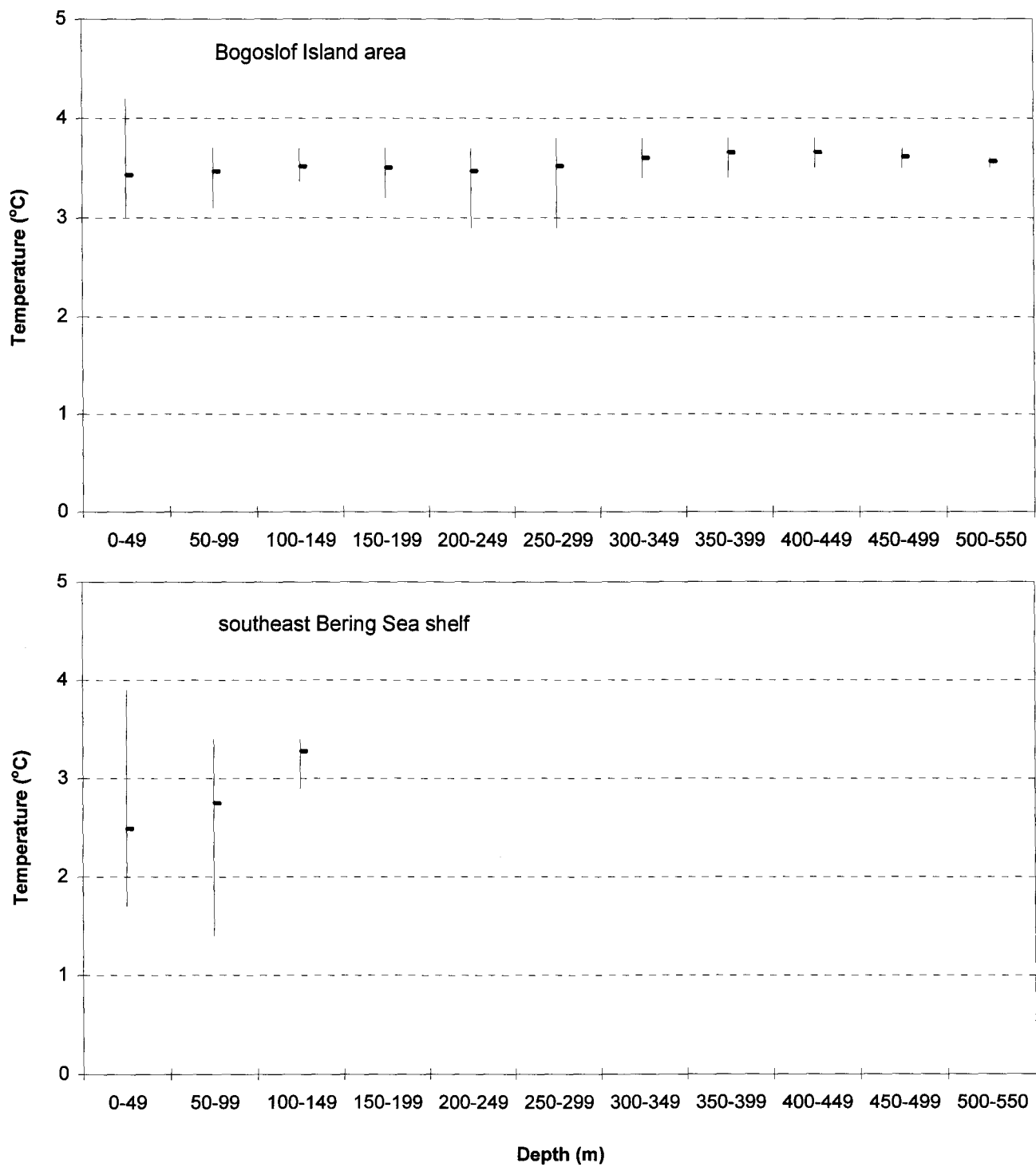


Figure 6. Average temperature by 50-m depth sections observed during the winter 2000 pollock acoustic-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas, MF2000-03. Data compiled from MBT and CTD casts.

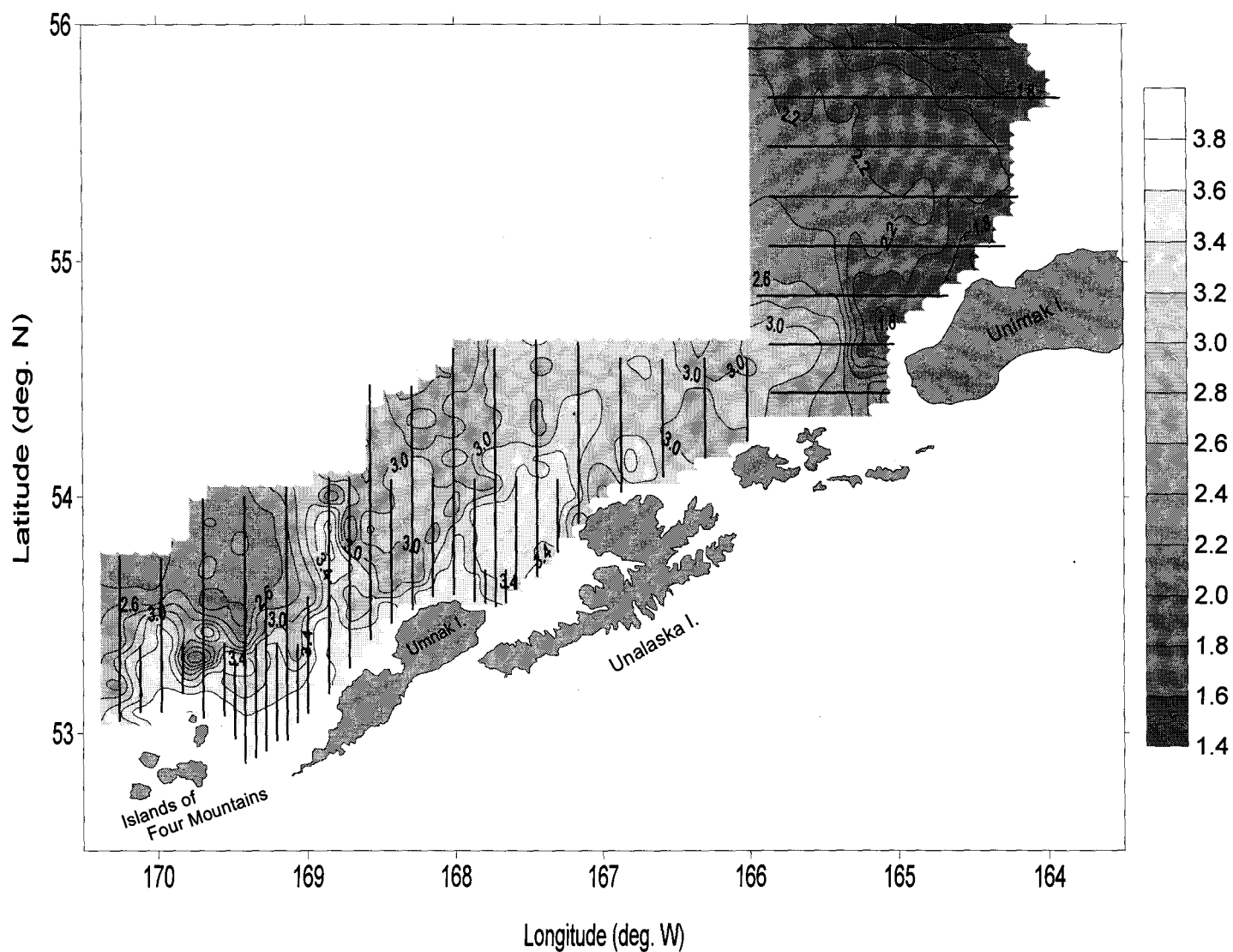


Figure 7. Transect lines with surface temperature contours (in degrees C) during the winter 2000 acoustic-trawl survey of the southeast Bering Sea shelf and Bogoslof Island areas, MF2000-03.